Prevention of Bacterial & Fungal PD Peritonitis

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NOVEMBER 1, 2011

Objectives

- Review best practices to reduce peritonitis
- Review successful program changes at FHA to reduce bacterial and fungal peritonitis

Fungal Peritonitis

- 1% - 15% of peritonitis are fungal
- mortality rate 5% to 53%
- failure to resume PD - up to 40%

Complications of Fungal Peritonitis

- Sclerosing peritonitis
- Adhesions → bowel obstructions
- Invasion of the bowel wall/abscess formation

Cause of Fungal Infection

- Breaks in sterile technique
- Exit site infection
- Intestinal perforation
- Peritoneo-vaginal fistulae
- Transmigration of fungi across the bowel wall

Antibiotics

- Association between recent antibacterial use and fungal peritonitis

Other Risk Factors

- Emergency PD
- HIV infection
- Extraperitoneal fungal infection
- Abdominal surgery

Diagnosis

- Typical findings of peritonitis
- Peritoneal fluid eosinophils

Diagnosis

- Candida species - usually grow quickly
- Other fungi - may require prolonged time
  - NB some cases present as “culture-negative” peritonitis

Treatment

- Lavage to prevent adhesions and lower fungal burden
- Antifungal treatment

Treatment

- Immediate PD catheter removal

- Mortality increased with delayed catheter removal (13/41, 31.7%) compared to patients with catheter removal within 24 hours (5/39, 12.8%) ($p < 0.01$)

Chang TI, Kim HW, Park JT, Lee DH, Lee JH, Yoo TH, Kang SW. Early catheter removal improves patient survival in peritoneal dialysis patients with fungal peritonitis: results of ninety-four episodes of fungal peritonitis at a single center. Perit Dial Int. 2011 Jan-Feb;31(1):60-6. Epub 2010 May 26.

Prophylaxis

- Observational intervention
- Nystatin 500,000 units TID
- Reduction in fungal peritonitis
  - 10.5% vs 3.1% ($p < 0.05$)

Záruba K, Peters J, Jungbluth H. Successful prophylaxis for fungal peritonitis in patients on continuous ambulatory peritoneal dialysis: six years' experience. Am J Kidney Dis. 1991 Jan;17(1):43-6.

Prophylaxis

- Observational
  - Initial: Nystatin 500,000 units TID; Fluconazole, 100 mg OD in diabetics
  - Changed to Fluconazole 100 mg q2d for all
- NB: with vancomycin, prophylaxis 5 additional days
- No further fungal infections

Moreiras-Plaza M, Vello-Román A, Sampróm-Rodríguez M, Feijóo-Piñeiro D. Ten years without fungal peritonitis: a single center's experience. Perit Dial Int. 2007 Jul-Aug;27(4):460-3.

daily vs q2d

- Fluconazole every 48 hours is adequate to maintain serum and peritoneal concentrations above the minimum inhibitory concentration for most Candida species

Debruyme D, Ryckelynck J-P, Moulin M, Hurault de ligny B, Levaltier B, Bigot M-C. Pharmacokinetics of fluconazole in patients undergoing continuous ambulatory peritoneal dialysis. Clin Pharmacokinet 1990; 18:491–8.

Prophylaxis

- Low baseline fungal peritonitis rates
- Negative observational trial

Wong PN, Lo KY, Tong GM, Chan SF, Lo MW, Mak SK, Wong AK. Prevention of fungal peritonitis with nystatin prophylaxis in patients receiving CAPD. Perit Dial Int. 2007;27(5):531.

Observational Data

- Programs with high baseline rates of fungal peritonitis found benefit
- Programs with low baseline rates did not detect a benefit

RCT Data

- Restrepo C, Chacon J, Manjarres G. Fungal peritonitis in peritoneal dialysis patients: successful prophylaxis with fluconazole, as demonstrated by prospective randomized control trial. Perit Dial Int. 2010 Nov-Dec;30(6):619-25. Epub 2010 Jul 15.

Question

- Whether oral administration of the antifungal fluconazole during treatment of bacterial peritonitis (BP), exit-site infection (ESI), or tunnel infection (TI) prevents fungal peritonitis

Trial Design

- Single site
- June 2004 to October 2007 (power calculation required >400 episodes)
- Enrollment criteria
  - peritonitis, tunnel infection, exit site infection
- Exclusion criteria
  - >70 yo, pregnant, allergy to azole, liver disease
- Randomization – not sophisticated

Primary Outcome

- Secondary fungal peritonitis
  - occurred 30-150 days after treatment for bacterial peritonitis

TABLE 1
General Characteristics of the Population Studied

	Fluconazole			
	Yes (n=210)		No (n=210)	
	(n)	(%)	(n)	(%)
Sex				
Female	117	55.7	94	44.76
Male	93	44.29	116	55.24
Age (years)				
18–30	30	14.29	33	15.71
31–40	34	16.19	31	14.76
41–50	46	21.90	58	27.62
51–60	63	30.00	55	26.19
61–70	37	17.62	33	15.71
Etiology of CKD				
Diabetic nephropathy	70	33.33	78	37.14
Unknown	35	16.67	31	14.76
Hypertensive nephropathy	36	17.14	30	14.29
Chronic glomerulonephritis	19	9.05	18	8.57
Chronic obstructive nephropathy	15	7.14	17	8.10
Chronic interstitial nephropathy	6	2.86	6	2.86
Lupus nephropathy	5	2.38	8	3.81
Other causes	24	11.43	22	10.48

CKD = chronic kidney disease.

Intervention

- Oral fluconazole (200 mg every 48 hours) during Abx treatment vs no treatment
- No placebo used

- Incomplete data on patients receiving abx outside of peritonitis, exit site infection, tunnel infection

Results

- Fluconazole prophylaxis
  - Secondary fungal peritonitis in 3/236
- No prophylaxis
  - Secondary fungal peritonitis 15/236
- p <0.05

- Total fungal peritonitis not reported by group
  - ie primary episodes + secondary episodes

Results

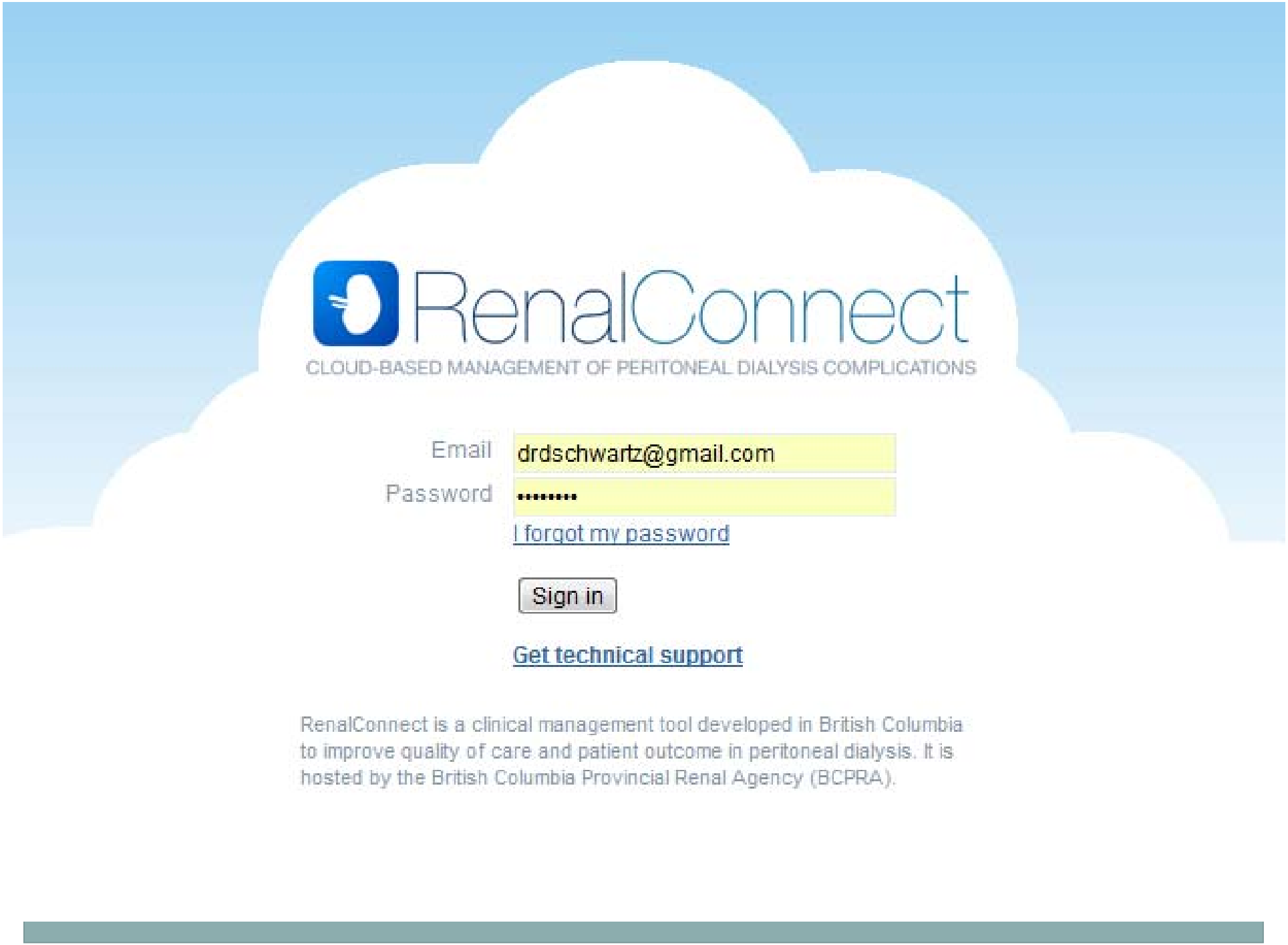
- Fluconazole resistance frequent
- After 3 weeks treatment, PD tube reinsertion attempted
  - Sclerosis/obliteration of peritoneal cavity in 11 patients
  - Successful in 19 patients

Summary

- Weaknesses
  - Methodologic issues - lack of placebo, flaws in randomization
  - Outcomes – didn't look at all-cause fungal peritonitis
- Strengths
  - Addresses important clinical problem
  - Robust reduction in events that should be modifiable

FHA Experience

- Noticed rising incidence of fungal peritonitis
- Instituted policy of fluconazole 100 mg q2d while on any antibiotics


RenalConnect
CLOUD-BASED MANAGEMENT OF PERITONEAL DIALYSIS COMPLICATIONS
Email
drdschwartz@gmail.com
Password
I forgot my password
Sign in
Get technical support
RenalConnect is a clinical management tool developed in British Columbia to improve quality of care and patient outcome in peritoneal dialysis. It is hosted by the British Columbia Provincial Renal Agency (BCPRA).

RenalConnect

New case | New patient | **Active cases** | All cases | Patients | Culture results | Reports

[redacted] Outpatient

Primary nurse: Koren Harmsma Nephrologist: Dr. Mohamud Karim PD centre:

Presentation date: **October 21st, 2011**
Last updated: **3 days ago**
Case type: de novo
Infection type: peritonitis
Follow-up visit: pending

Culture report: Final: Culture negative (3 days ago)
Final antibiotics: **Fluconazole** 100 mg Q2D, **Vancomycin** 1000 mg Q3

NEXT STEP: COMPLETE ANTIBIOTIC COURSE

[redacted] Outpatient

Primary nurse: Marianne Robbie Nephrologist: Dr. George Lam PD centre: RCH

Presentation date: **October 16th, 2011**
Last updated: **3 days ago**
Case type: de novo
Infection type: peritonitis
Follow-up visit: pending

Culture report: pasteurella species (13 days ago)
Final antibiotics: **Ceftriaxone** 1 g QD, **Fluconazole** 100 mg Q2D

NEXT STEP: GET CULTURE RESULT

[redacted]nas Outpatient

Primary nurse: Marianne Robbie Nephrologist: Dr. Daniel Schwartz PD centre: RCH

Presentation date: **October 17th, 2011**
Last updated: **3 days ago**

Culture report: Final: Culture negative (3 days ago)
Final antibiotics: **Fluconazole** 100 mg Q2D, **Cefazolin** 2000 mg QD

RenalConnect

New case | New patient | Active cases | All cases | Patients | Culture results | Reports

For **April 30th, 2011** to **October 31st, 2011**

Switch to 2011-04-

past month quarte

Peritonitis rate

33.3

months between episodes

1799 patient-months of peritoneal dialysis at risk
325 patients at risk
54 new cases of peritonitis

Hospitalization

25%

of cases require hospitalization during this time period

15 cases requiring hospitalization
60 cases in total

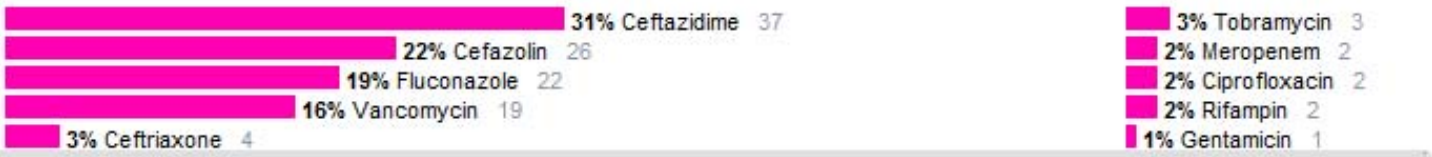
Negative cultures

20%

of cultures yield negative results during this time period

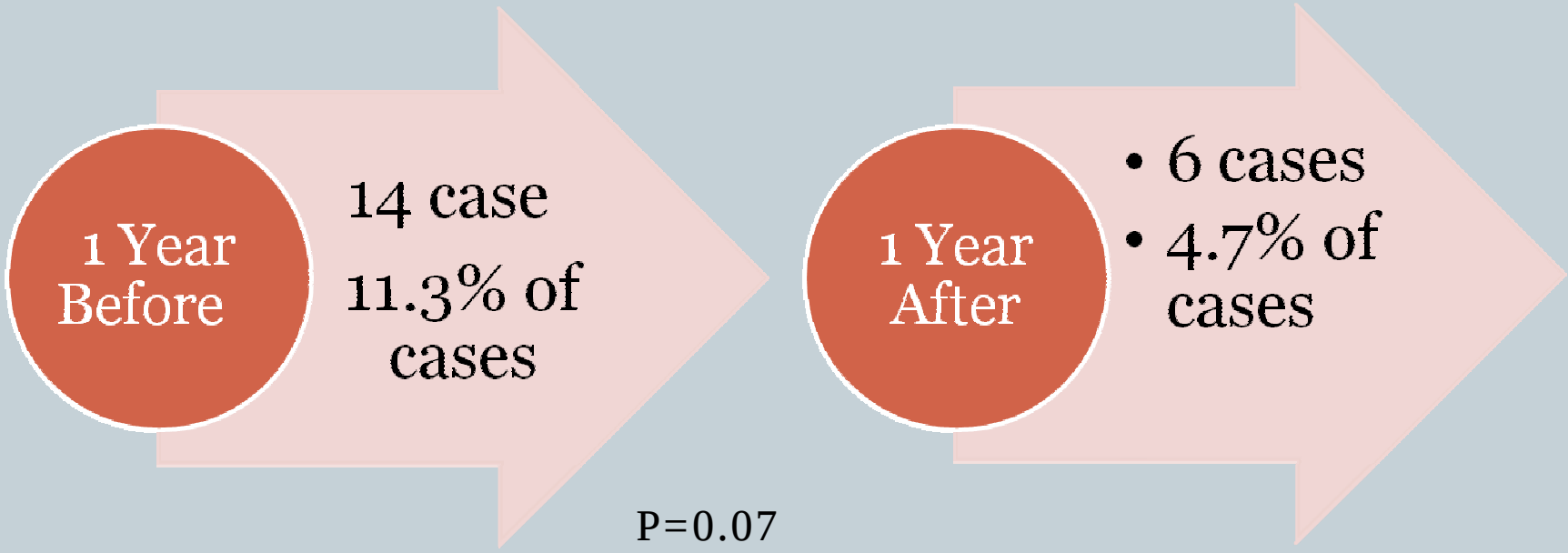
only cultures from peritonitis cases are counted
12 cultures negative
61 total cultures ordered

Antibiotics, as empiric treatment (peritonitis only)



https://renalconnect.com/cgi-bin/ajax.pl?token=86d3ca6012bcbb4b50663021920b9ef1&ref=view_patients&do=add_patient_form

Reduction in Fungal Peritonitis



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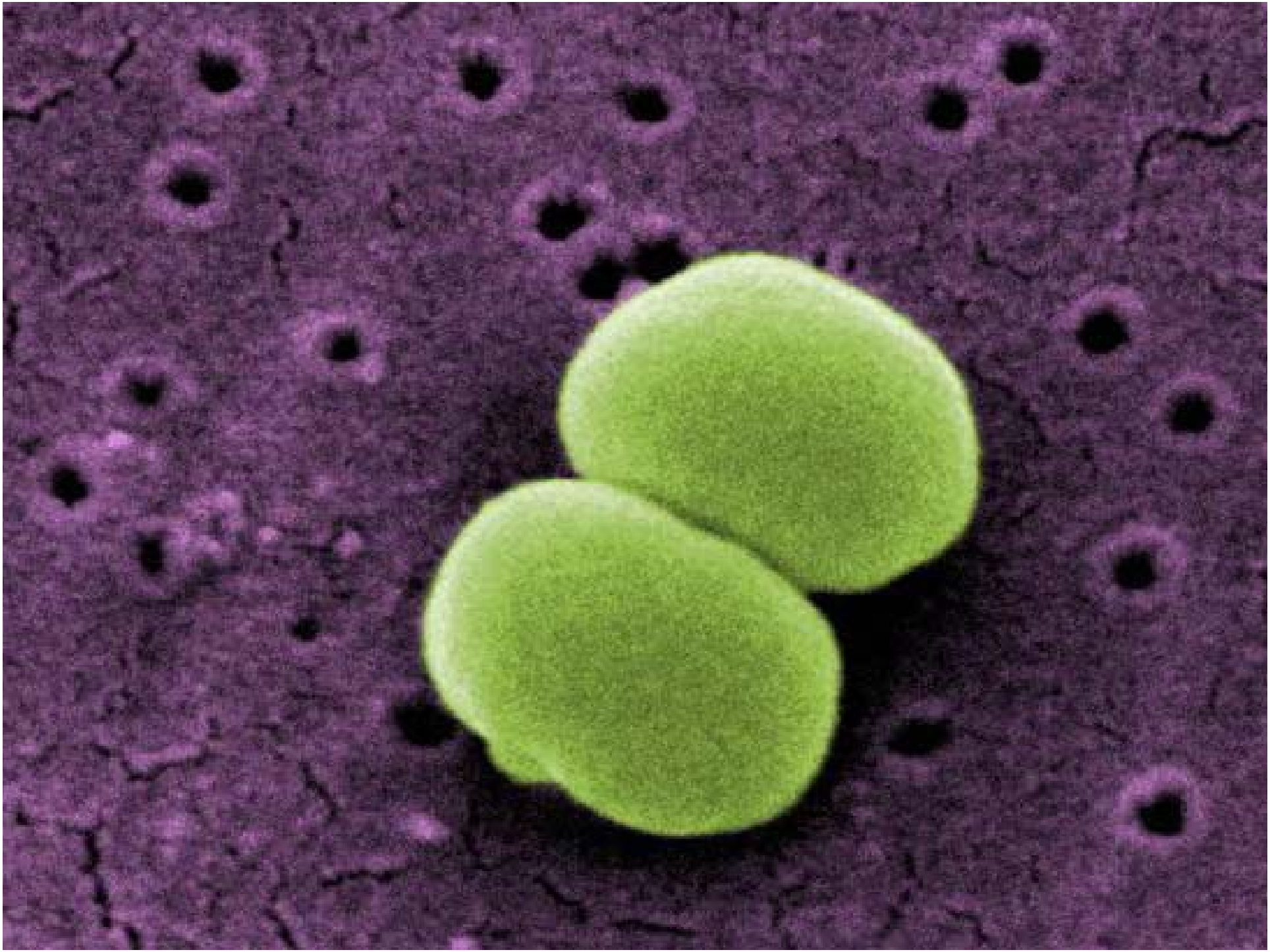
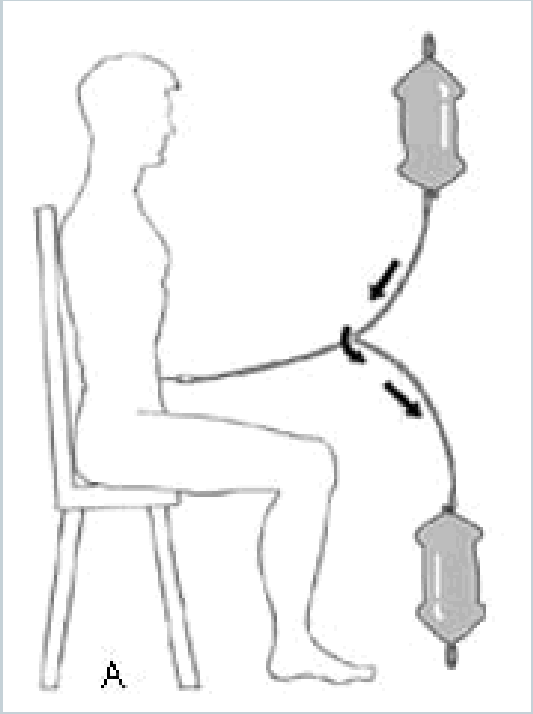


Why Bacterial Peritonitis?

- Source
  - Contaminations
  - Bacteria can track along tunnel & catheter
  - Biofilm
- Impaired host defense
  - Nonphysiologic fluid in the peritoneum
  - Macrophages and cytokines that are activated during a potential infection are constantly removed during exchanges
  - Mesothelial surfaces impaired by fluid separation

Flush before Fill



Enhanced Training

- Adult-learning theory based curriculum
  - Reduced peritonitis, exit site infection
  - Less transfer to HD
  - Better fluid management, compliance

Hall G, Bogan A, Dreis S, Duffy A, Greene S, Kelley K, Lizak H, Nabut J, Schinker V, Schwartz N. New directions in peritoneal dialysis patient training. Nephrol Nurs J. 2004;31(2):149.

Peri-Procedural

- Extensive dental procedures
  - 2 h pre, single 2 gm oral dose of amoxicillin
- Colonoscopy with polypectomy
  - 1 gm IV ampicillin plus a single dose of an aminoglycoside
- Drain fluid prior to any procedure involving the abdomen or pelvis

PD Catheter Insertion

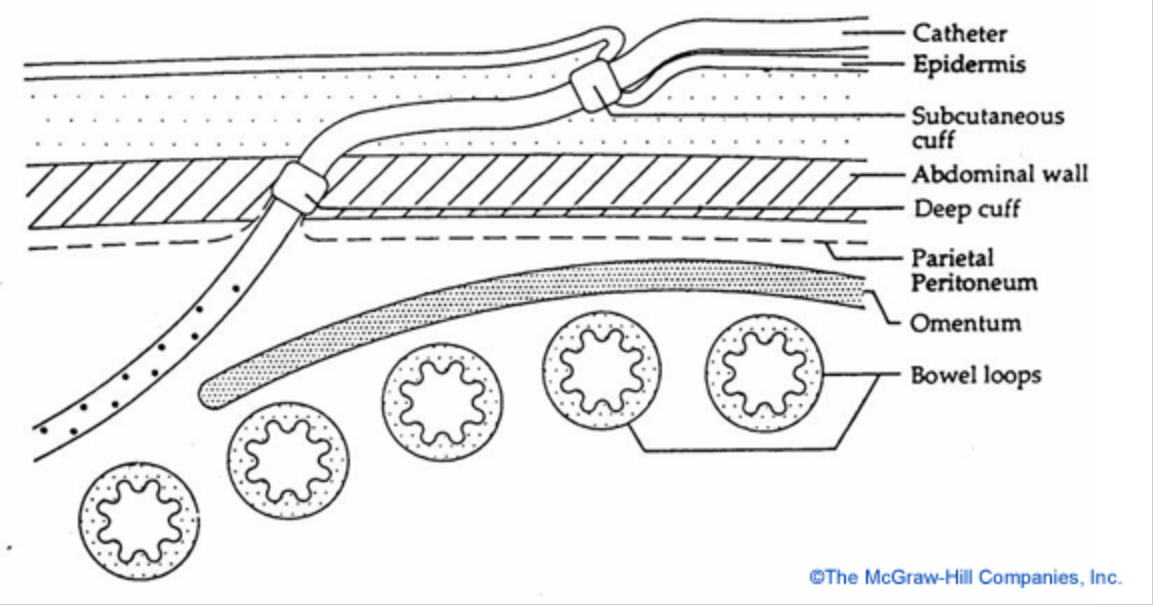
- Largest RCT
  - Vanco vs Cefazolin vs no Abx
  - Reduced short term peritonitis (<2 wks)
  - 1%, 7%, and 12% for the vancomycin, cefazolin, and no treatment groups

  Gadallah et al. Role of preoperative antibiotic prophylaxis in preventing postoperative peritonitis in newly placed peritoneal dialysis catheters. Am J Kidney Dis. 2000;36(5):1014.
- Systematic review
  - perioperative IV antibiotics vs no treatment, reduced peritonitis within one month of surgery (RR of 0.35, 95% CI 0.15 to 0.80)

  Strippoli et al. Antimicrobial agents to prevent peritonitis in peritoneal dialysis: a systematic review of randomized controlled trials. Am J Kidney Dis. 2004;44(4):591.
- Recommendation: avoid vancomycin d/t concerns re: resistance

PD Catheter Insertion

- Downwardly-directed tunnel




Exit Site Infection
Peritonitis

Exit site care

- Peritonitis more likely in patients with exit site infection
- No placebo controlled trial of exit site care

History

- Rifampin vs placebo
  - Zimmerman et al
  - Risk factors for infection include nasal S. aureus carriage and S. aureus at exit site
- Exit site Mupirocin vs PO Rifampin
  - No difference
  - Less infections than historical rates

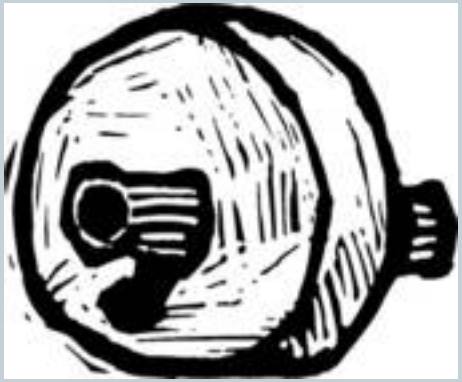
History

- Nasal Mupirocin in S aureus nasal carriers
  - Reduced peritionitis , ESI
- Gentamicin cream vs mupirocin cream
  - Reduced pseudamonas ESI
  - Reduced total peritonitis
    0.34 episodes/year vs 0.52, p = 0.03
  - Small increase fungal ESI

Fraser Health Experience

- Peritonitis rate up to 1 in 20 months in 2008
- Goal to decrease peritonitis rate

Intervention at FHA



Case Reviews

Review all cases of peritonitis and draw out lessons from cases when possible

Strategies

- Increased consistency of home visits after peritonitis
- More rigorous re-training post peritonitis
- Increased consistency of capturing hospitalized patients
- Updated education re: hand-washing /peritonitis prevention during training
- Most consistent re-inforcement of mask usage
- Encouraged catheter change when necessary
- Utilized physician champion as go-between to approach physicians
- Reviewed antibiotic treatment
  - Reduced under-dosing Vancomycin
  - Reduced under-treatment of culture negative peritonitis
- Used renalconnect.com to ensure consistent & algorithm based case management
- Moved to “real-time” program review (rather than retrospective)

Hawthorne Effect

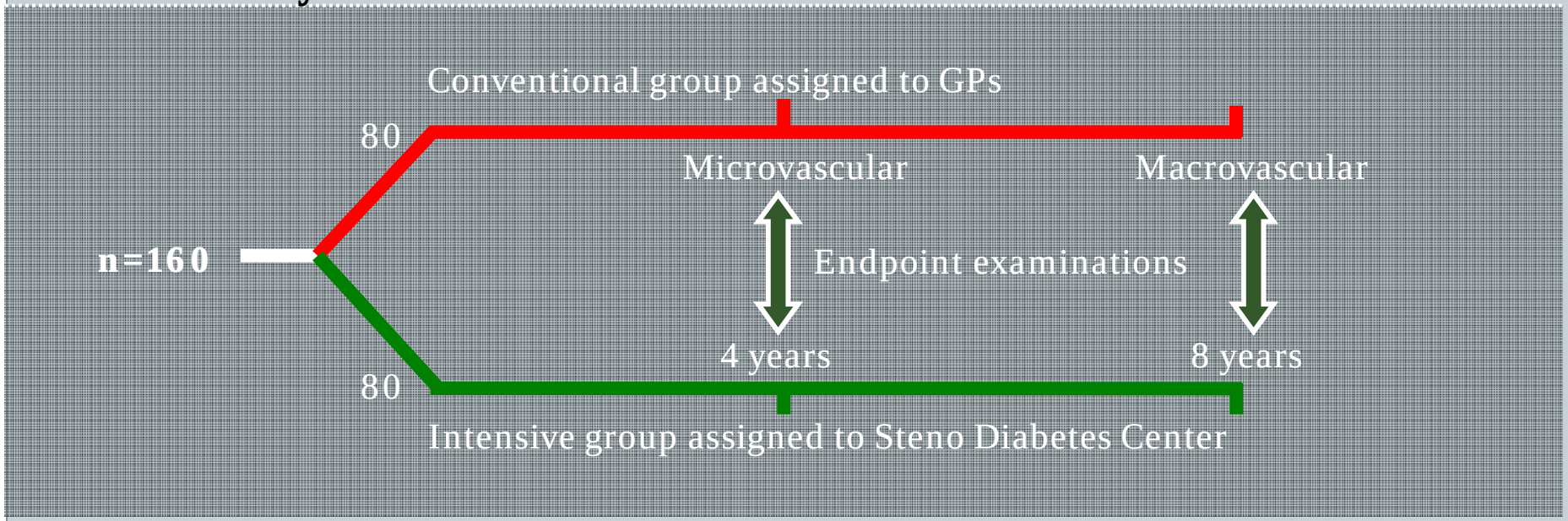
Impact of observation

Multimodal Interventions

Through Enough Crap at the Wall

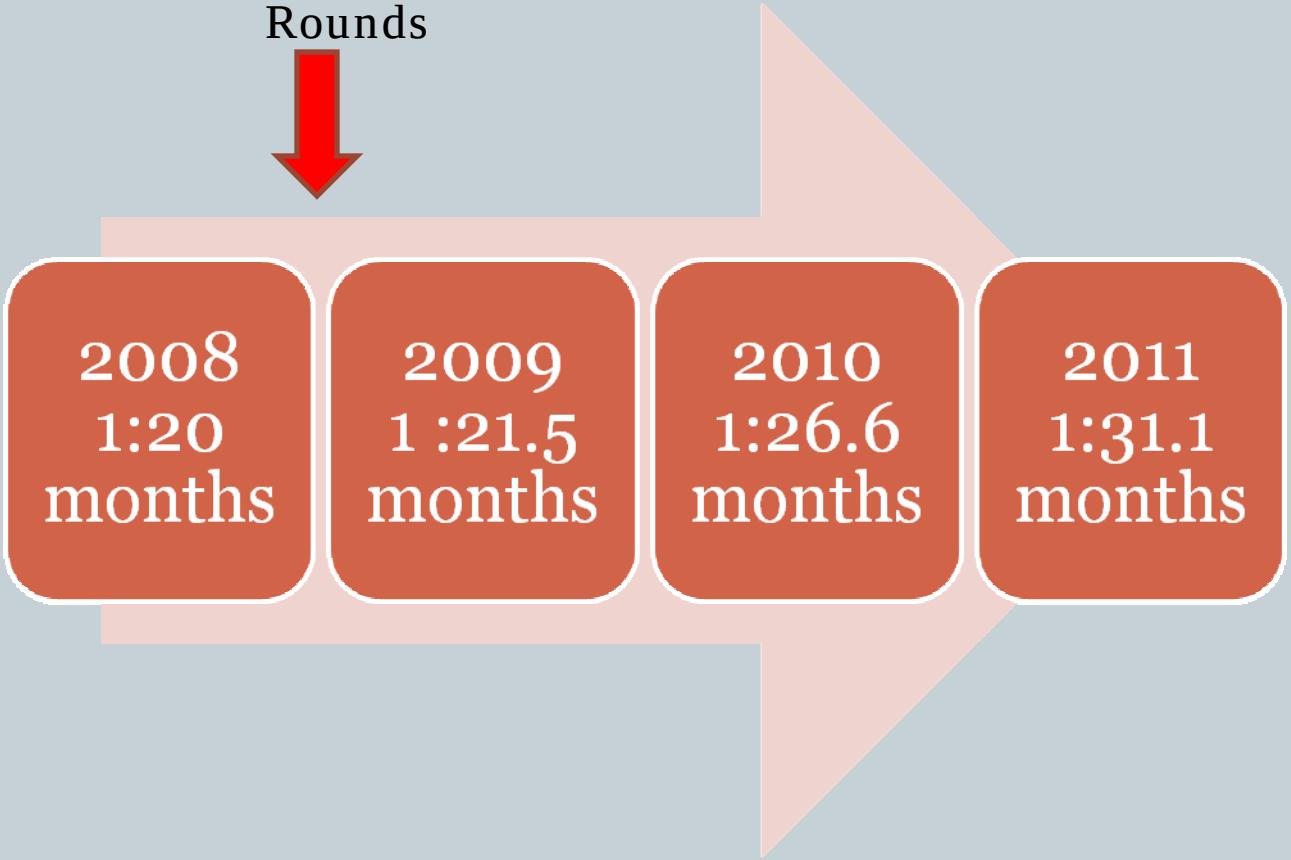
Steno-2

- **160 patients with type 2 diabetes & microalbuminuria**
- **Concealed randomization**
- **Allocated conventional therapy or intensive care at Steno Diabetes Center**
- **Mean treatment period 7.8 years → followed observationally for mean 5.5 years**



Peritonitis Rate

1st Peritonitis Rounds



Fungal Peritonitis | Summary

- Centres with high rates of fungal peritonitis shows reduction in incidence (observational and randomized data)
- Fluconazole data stronger/more consistent than nystatin

Bacterial Peritonitis | Summary

- Value of multi-modal interventions across a program
- Peri-procedural prophylaxis
- Training/education
- Exit site care (cleansing, Abx prophylaxis)

Questions/Comments